

Claims

1. A transgenic cell comprising a nucleic acid molecule comprising a nucleic
5 acid sequence selected from the group consisting of:

- i) a DNA molecule consisting of a DNA sequence as represented in Figures 1a, 1b or 1c;
- 10 ii) a DNA molecule which hybridises to the sequences identified in (i) above and which encode a polypeptide which has fatty acid elongase activity; and
- iii) DNA molecules consisting of DNA sequences that are degenerate as a result of the genetic code to the DNA sequence defined in (i) and (ii)

2. A cell according to Claim 1 wherein said nucleic acid molecule anneals under
15 stringent hybridisation conditions to the sequences described in (i), (ii) and (iii) above.

3. A cell according to Claim 1 or 2 wherein said nucleic acid molecules are isolated from an algal species.

20 4. A cell according to Claim 3 wherein said algal species is selected from the group consisting of: *Amphidinium carterae*, *Amphiphora hyalina*, *Amphiphora* sp., *Chaetoceros gracilis*, *Coscinodiscus* sp., *Cryptocodonium cohnii*, *Cryptomonas* sp., *Cylindrotheca fusiformis*, *Haslea ostrearia*, *Isochrysis galbana*, *Nannochloropsis oculata*, *Navicula* sp., *Nitzschia closterium*, *Pavlova lutheri*, *Phaeodactylum tricornutum*, *Prorocentrum minimum*, *Rhizosolenia setigera*, *Skeletonema costatum*, *Skeletonema* sp., *Tetraselmis tetrathele*, *Thalassiosira nitzschiooides*, *Thalassiosira heterophorma*, *Thalassiosira pseudonana*, *Thalassiosira stellaris*.

5. A cell according to any of Claims 1-4 wherein said polypeptide is a variant polypeptide and comprises the amino acid sequence represented in Figure 2a, 2b, or 2c which sequence has been modified by deletion, addition or substitution of at least one amino acid residue wherein said modification enhances the enzyme activity of
5 said polypeptide.

6. A cell according to Claim 5 wherein said modified polypeptide has enhanced fatty acid elongase activity

10 7. A cell according to any of Claims 1-4 wherein said polypeptide comprises the amino acid sequence represented in Figures 2a, 2b or 2c.

8. A cell according to Claim 7 wherein said polypeptide consists of the amino acid sequence represented in Figures 2a, 2b or 2c.

15 9. A cell according to any of Claims 1-8 wherein said cell is transfected with a nucleic acid molecules selected from the group consisting of nucleic acid sequences selected from the group consisting of:

- i) a DNA molecule consisting of the DNA sequence as represented in Figures 1a, 1b or 1c;
- 20 ii) DNA molecules which hybridise to the sequences identified in (i) above and which encode a polypeptide which has fatty acid elongase activity; and
- iii) DNA molecules comprising DNA sequences that are degenerate as a result of the genetic code to the DNA sequence defined in (i) and (ii); combined with at least one of the nucleic acid molecules selected from the group consisting of:
- 25 iv) DNA molecules consisting of DNA sequences as represented in Figures 3a, 4a, 5a or 6a;

- v) DNA molecules which hybridise to the sequences identified in (i) above and which have desaturase, acyl-CoA synthetase or diacylglycerol acyltransferase activity;
- vi) DNA molecules comprising DNA sequences that are degenerate as a result of the genetic code to the DNA sequence defined in (iv) and (v) above.

5 10. A cell according to Claim 9 wherein said cell is a plant cell.

10 11. A plant comprising a cell according to any of Claim 1-10.

12. A seed comprising a cell according to any of Claims 1-10.

13. A foodstuff product comprising a cell according to any of Claims 1-10.

15 14. A foodstuff product according to Claim 13 wherein said foodstuff is selected from the group consisting of: wine; beer; bread, baking products (e.g. bread, cake); vegetable extracts.

20 15. A food stuff according to Claim 13 wherein said foodstuff is wine or beer.

16. A fermentation process comprising a cell according to any of Claims 1-10.

25 17. A fermentation process according to Claim 16 said process comprises the steps of :

- i) providing a vessel containing a cell according to the invention and constituents required for fermentation and fatty acid biosynthesis; and
- iii) providing conditions conducive to the fermentation of the liquid composition contained in said vessel.

30 18. An animal feed product comprising a cell according to any of Claims 1-10.

19. A method of modulating the level of n-3 fatty acid in a plant cell comprising,

- i) providing a plant cell according to Claim 10;
- iv) regenerating the plant cell into a plant; and
- v) monitoring n-3 fatty acid production by said plant.

20. A method for the production and optionally the extraction of n-3 fatty acids comprising:

10 i) providing a cell according to any of Claims 1-10;
ii) providing conditions conducive to the growth of said cell; and
iii) extracting n-3 fatty acids, or variants thereof, from said cell.

21. A method for the production and optionally the extraction of n-3 fatty acid comprising:

- i) providing a plant cell according to Claim 10;
- ii) regenerating said cell into a plant; and
- iii) extracting n-3 fatty acids, or variants thereof from said plant.

20 22. A reaction vessel comprising at least one cell according to the invention, fatty acid substrates and co-factors characterised in that said vessel is adapted for the conversion of said fatty acids substrates to n-3 fatty acids.

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